



# T3 STAR TRACKER

## Miniaturized Optical Head with Built-In Processing Unit

### STAR-TRACKER-ON-A-CHIP TECHNOLOGY

The compact T3 star tracker is ideally suited for nano- and microsatellite missions with lifetime in excess of 5 years. The star tracker is developed by Terma A/S and Space Inventor ApS based on a scaled-down version of the Terma T1 star tracker with a smaller optical system and computer processing unit based on high reliable COTS components.

The Optical Head (OH) is based on the sensor chip Faintstar-2 developed under ESA contracts. The Faintstar-2 is a CMOS Active Pixel Sensor with a suite of integrated on-chip functionality supporting a completely new class of miniaturized high performance star trackers.

Terma has taken the miniaturization challenge as far as possible, without compromising the accuracy required from a state-of-the-art star tracker.

The processing unit accommodates the star catalogue and software algorithms for autonomous attitude acquisition and tracking.

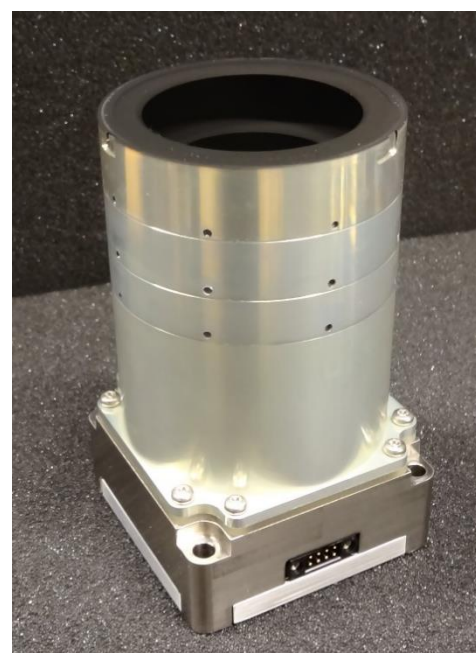
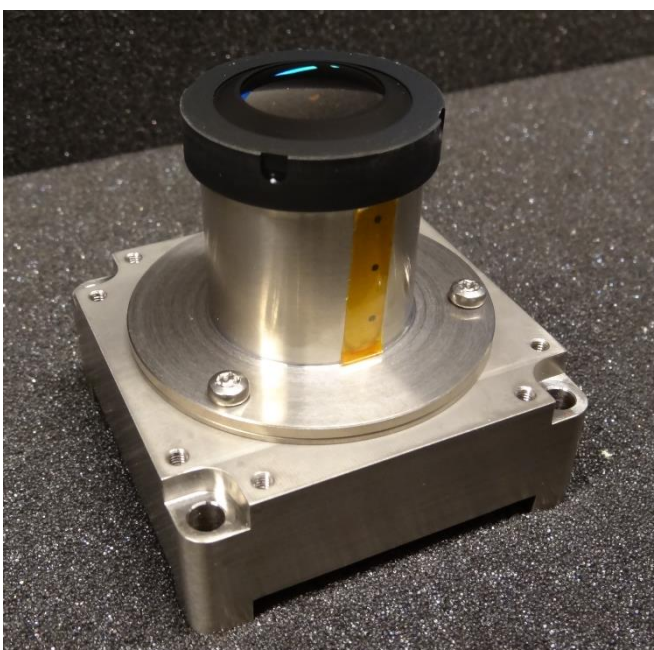
### FEATURES

- High accuracy
- Very compact with build in processing unit
- Rad-hard aspherical optics
- Integrated baffle with outstanding straylight attenuation
- Excellent thermal stability
- Extremely low recurrent cost at larger quantities

### QUALIFICATION STATUS

- TRL 8 – first flight in 2021.

Interested parties are invited to contact the lead engineer, Peter Davidsen, [pd@terma.com](mailto:pd@terma.com) or the commercial contact, Hans Henrik Bonde, [hnb@terma.com](mailto:hnb@terma.com)



# Miniaturized Optical Head with Built-In Processing Unit

	T3
Accuracy	See below
Maximum Update Rate	5 Hz
Slew Rate	< 0.3 deg/sec full performance < 1.5 deg/sec reduced performance
Acquisition time	10 s
Sun exclusion angle (shown example, other options on request)	37.5 deg
SAA & SEU Tolerance worst case GEO flux (25k protons/cm2/s)	Acquisition & tracking full performance
Field of View	20 deg circular, full moon accepted in FOV
APS Resolution	1024 x 1024 pixels
Lifetime	> 5 years
Lenses	Aspherical, radiation hard glasses
Power consumption	2 W
Supply Voltage	5 – 12 V
Spacecraft Interface (TC/TM)	CAN or RS422
Interface Connector	Harwin M80
Computer Architecture	Zynq Ultrascale
Mass	350 g
Dimensions	60 x 60 x 100 mm <sup>3</sup>
Operating Temperature	-40 °C to +30 °C (full performance) +30 °C to +50 °C (reduced performance)
Survival Temperature	-40 °C to +70 °C

## T3 STAR TRACKER ACCURACY

Performance		BOL (EOL)	
Bias	[arcsec] max	10	
Thermal Stability	[arcsec/K] max	0.1	
Spatial Error (FOV)	[arcsec] 3 $\sigma$	2.1	
Spatial Error (Pixel)	[arcsec] 3 $\sigma$	1.3 (1.7)	
		+30°C	+50°C
Temporal Noise (rate < 0.3 deg/sec)	[arcsec] 3 $\sigma$	2.0 (2.6)	8 (10)
Temporal Noise (rate < 0.8 deg/sec)	[arcsec] 3 $\sigma$	6 (8)	24 (31)
Temporal Noise (rate < 1.50 deg/sec)	[arcsec] 3 $\sigma$	22 (29)	89 (114)

General remark: All parameters are quoted for normal to Line of Sight (LOS) directions. Along LOS, values are a factor of 7 higher, except for the Bias and Thermal Stability parameters.



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## ORDERING INFORMATION

The T3 star tracker components can be ordered according to the table below.

Legend:

- A component is identified by a part number and dash variant according to xxxxxxx-yyy
- A component can be ordered as an engineering model (EM) or flight model (FM)
- EEE screening level is per default grade 2 (QML-Q) for sensor and proximity electronics. Computer EEE components are high reliable COTS

Component	P/N [xxxxxxx]	EM [-yyy]	FM [-yyy]
T3 with RS422 TCTM interface and 37.5 Sun exclusion angle baffle	1445040	-218	-018
T3 with CAN bus TCTM interface and 37.5 Sun exclusion angle baffle	TBD	-218	-018
Dynamic OGSE, 37.5 deg SEA Baffle interface		1665815-037	
Static OGSE, 37.5 deg SEA Baffle interface		903964-037	



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